

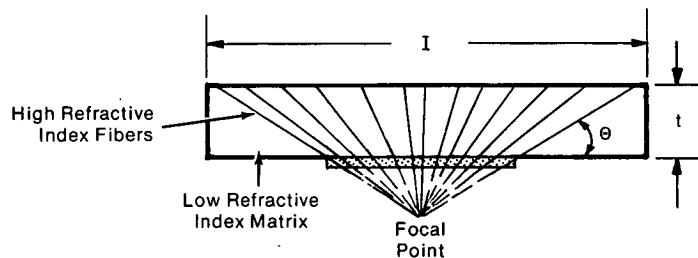
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Marshall Space Flight Center



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Contact-Eutectic-Lens Fabrication Technique



Plain View of Optical-Fiber Eutectic Lens

A new optical-fiber fabrication technique has been developed for the manufacture of contact eutectic lenses. Glass fibers are normally used since their optical transmission characteristics are easy to control. The new lens fabrication method enables crystal or semiconductor materials with selective spectral-response characteristics (ultraviolet, visible, or infrared wavelengths) to be used. Also, common lenses change the direction of light propagation solely by means of the interface and curvature of the lens. Contact eutectic lenses vary the direction of light propagation along the fibers; the light is guided by internal reflections between the fibers and the matrix (see figure).

Contact eutectic lenses are produced by using continuous fan-shaped optic fibers in a unidirectional (zonal) solidification process. These fibers of high refractive index are embedded in a continuous matrix of material having a lower refractive index. For a minimum angle of inclination, Θ , of the fiber relative to the plane, as illustrated, a lens plate of thickness t is

$$\left(1 - \frac{1}{M}\right) \left(\frac{I}{2}\right) \tan \Theta$$

where I is the image size and M is the desired magnification ratio of an object in contact with the lens.

The new lenses can be produced in any shape and can be used when the object-to-lens distance is zero,

as when wearing conventional contact lenses. Other applications include reading-glass optics, photographic enlargement or reduction, and enlarging microfilm.

Note:

Requests for further information may be made in writing to:

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Patent status:

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